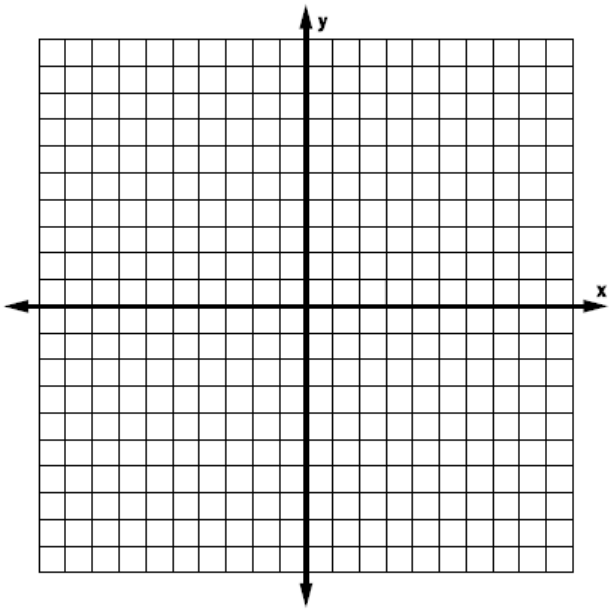
Pre-AP Geometry: The Triangle Midsegment Theorem (pp 334-335)

<u>Attendance Problems</u>. Use the points *A*(2, 2), *B*(12, 2) and *C*(4, 8).



1. Find X & Y, the midpoints of $\overline{AC}$ & $\overline{CB}$.

2. Find XY.

3. Find AB.

4. Find the slope of $\overline{AB}$.

5. Find the slope of $\overline{XY}$.

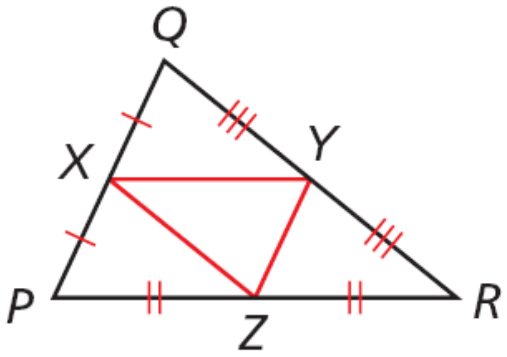
6. What is the slope of a line parallel to $3x + 2y = 12$?

I can prove and use properties of triangle midsegments.

Vocabulary: Midsegment of a triangle

Common Core: CC.9-12.G.CO.10 Prove theorems about triangles.

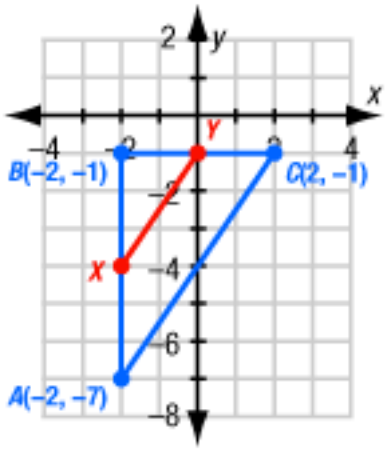
A **midsegment of a triangle** is a segment that joins the midpoints of two sides of the triangle. Every triangle has three midsegments, which form the *midsegment triangle*.



Midsegments: $\overline{XY}$, $\overline{YZ}$, $\overline{ZX}$

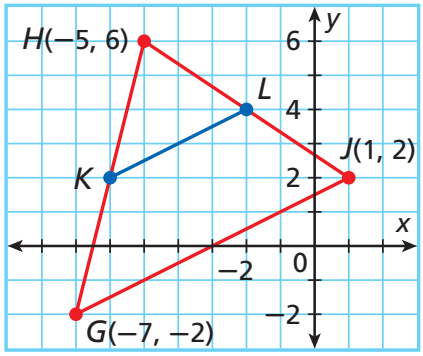
Midsegment triangle: $\triangle XYZ$

<u>Video Example 1</u>. In $\triangle ABC$, show that the midsegment $\overline{XY}$ is parallel to $\overline{AC}$ and that $XY = \frac{1}{2}AC$.



1 Examining Midsegments in the Coordinate Plane

In $\triangle GHJ$, show that midsegment $\overline{KL}$ is parallel to $\overline{GJ}$ and that $KL = \frac{1}{2}GJ$.



Step 1 Find the coordinates of K and L.

$$\text{mdpt. of } \overline{GH} = \left(\frac{-7+(-5)}{2}, \frac{-2+6}{2}\right) = (-6, 2)$$

$$\text{mdpt. of } \overline{HJ} = \left(\frac{-5+1}{2}, \frac{6+2}{2}\right) = (-2, 4)$$

Step 2 Compare the slopes of $\overline{KL}$ and $\overline{GJ}$.

$$\text{slope of } \overline{KL} = \frac{4-2}{-2-(-6)} = \frac{1}{2} \qquad \text{slope of } \overline{GJ} = \frac{2-(-2)}{1-(-7)} = \frac{1}{2}$$

Since the slopes are the same, $\overline{KL} \parallel \overline{GJ}$.

Step 3 Compare the lengths of $\overline{KL}$ and $\overline{GJ}$.

$$KL = \sqrt{\left[-2-(-6)\right]^2 + (4-2)^2} = 2\sqrt{5}$$

$$GJ = \sqrt{\left[1-(-7)\right]^2 + \left[2-(-2)\right]^2} = 4\sqrt{5}$$

Since $2\sqrt{5} = \frac{1}{2}\left(4\sqrt{5}\right)$, $KL = \frac{1}{2}GJ$.

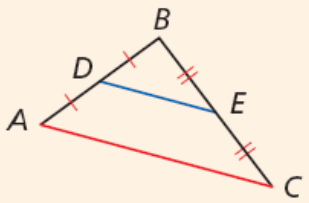
Example 1. The vertices of ΔXYZ are $X(-1, 8)$, $Y(9, 2)$, and $Z(3, -4)$. M and N are the midpoints of XZ and YZ. Show that $\overline{MN} \parallel \overline{XY}$ and $MN = \frac{1}{2}XY$.

7. <u>Guided Practice</u>. The vertices of ΔRST are R(–7, 0), S(–3, 6), and T(9, 2). M is the midpoint of $\overline{RT}$, and N is the midpoint of $\overline{ST}$. Show that $\overline{MN} \parallel \overline{RS}$ and $MN = \frac{1}{2}RS$.

Theorem 5-4-1 **Triangle Midsegment Theorem**

A midsegment of a triangle is parallel to a side of the triangle, and its length is half the length of that side.

$\overline{DE} \parallel \overline{AC}$, $DE = \frac{1}{2}AC$

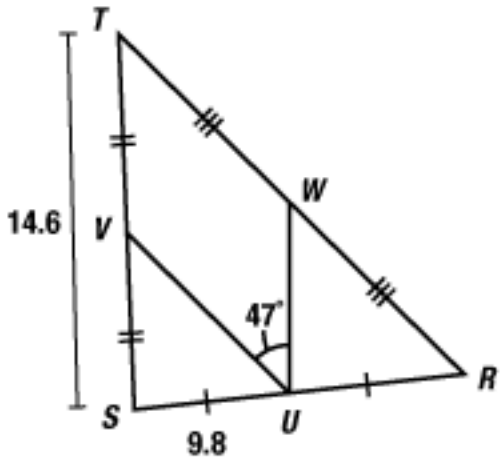


Q: What did the visitor from Planet Metric demand?
A: "Take me to your liter!"

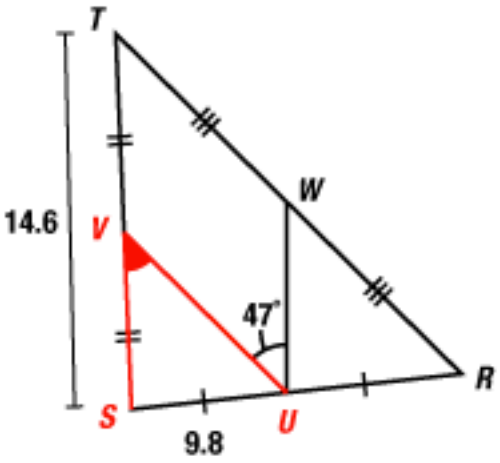
"Remember, Information is not knowledge; Knowledge is not Wisdom; Wisdom is not truth; Truth is not beauty; Beauty is not love; Love is not music; Music is the best." -- *Frank Zappa*

Video Example 2. Find each measure.

UW

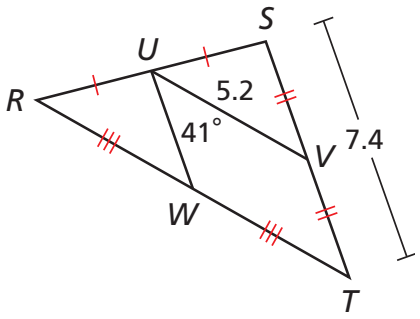


m∠SVU



2 Using the Triangle Midsegment Theorem

Find each measure.



A UW

$UW = \frac{1}{2}ST$ — *△ Midsegment Thm.*

$UW = \frac{1}{2}(7.4)$ — *Substitute 7.4 for ST.*

$UW = 3.7$ — *Simplify.*

B $m\angle SVU$

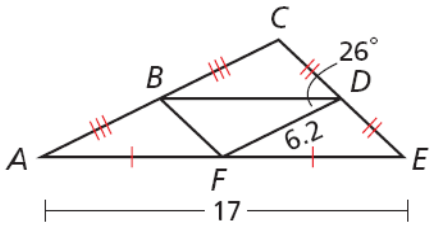
$\overline{UW} \parallel \overline{ST}$ — *△ Midsegment Thm.*

$m\angle SVU = m\angle VUW$ — *Alt. Int. ∠s Thm.*

$m\angle SVU = 41°$ — *Substitute 41° for m∠VUW.*

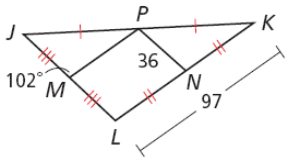
Example 2. Find each measure.

A. BD **B.** $m\measuredangle CBD$



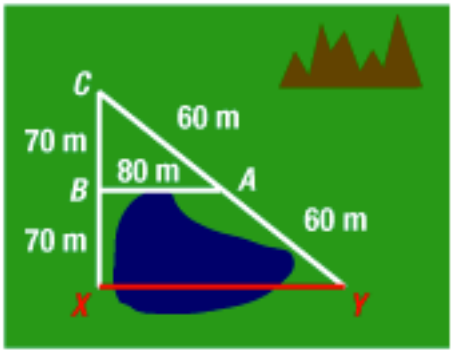
Guided Practice. Find each measure.

8. JL **9.** PM



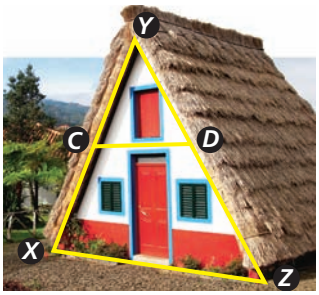
10. $m\measuredangle MLK$

Video Example 3. Mark wants to find the distance across the lake near his house. He measures a triangle at one side of the lake as shown in the diagram. What is XY?



Example 3. In an A-frame support, the distance PQ is 46 inches. What is the length of the support *ST* if S and T are at the midpoints of the sides?

11. Guided Practice. In this A-frame house, the width of the first floor $\overline{XZ}$ is 30 feet. The second floor $\overline{CD}$ is slightly above and parallel to the midsegment of $\triangle XYZ$. Is the width of the second floor more or less than 5 yards? Explain.



5-4 Triangle and Midsegment theorem

- *(p 336)* 10 ,13, 15, 17, 18, 22, 37.
- 5A Ready to Go On & posttests.